(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 427 183 A1

(12) EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(43) Date of publication:
09.06.2004 Bulletin 2004/24

(21) Application number: **02755882.4**

(22) Date of filing: **08.08.2002**

(51) Int Cl.[7]: **H04N 1/60**, H04N 1/46, G06T 1/00

(86) International application number:
PCT/JP2002/008140

(87) International publication number:
WO 2003/017642 (27.02.2003 Gazette 2003/09)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR

(30) Priority: **17.08.2001 JP 2001248210**

(71) Applicant: **Sony Corporation**
Tokyo 141-0001 (JP)

(72) Inventor: **ISHIGAMI, Koichiro,**
SONY CORPORATION
Tokyo 141-0001 (JP)

(74) Representative: **Pilch, Adam John Michael et al**
D. YOUNG & CO.,
21 New Fetter Lane
London EC4A 1DA (GB)

(54) IMAGE SIGNAL PROCESSING METHOD AND IMAGE SIGNAL PROCESSING APPARATUS

(57) Disclosed is a picture signal processing method for outputting a color picture. In encoding input picture data YCbCr into picture data for printing in a YCC picture formulating unit (2), chromaticity Cb, Cr are processed non-linear conversion processing by a non-linear function f(c), with the luminance Y remaining unaffected, to generate picture data for printing YCb'Cr'. In a cmyk converter 3, the picture data for printing YCb'Cr', generated by the YCC picture formulating unit (2), are processed nonlinear conversion processing by an inverse function f' (c) of the non-linear function f(c) to perform color space conversion processing matched to the color space of an output device. This converts the picture data for printing YCb'Cr' into picture data for output printing cmyk to improve color reproducing quality by controlling the encoding density locally in a wide color gamut.

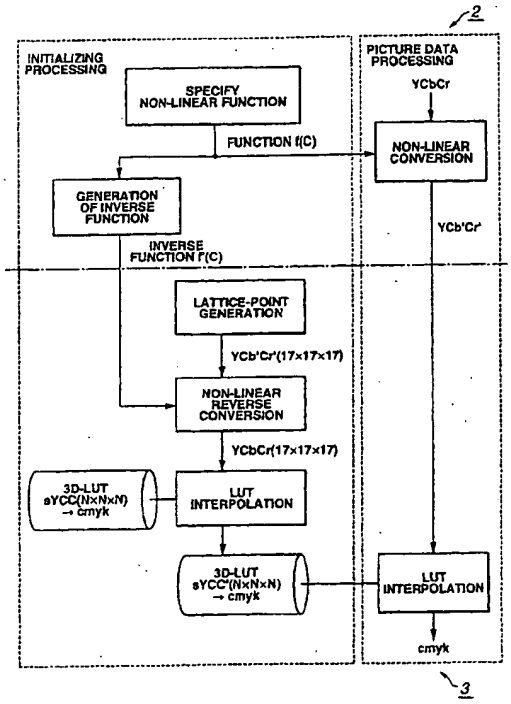

FIG.5

EP 1 427 183 A1

Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] This invention relates to a picture signal processing method and a picture signal processing apparatus for outputting a color picture.

Background Art

[0002] Recently, reduction in cost and increase in the processing speed in devices handling color picture data are progressing speedily and, in keeping pace therewith, a wide variety of systems, handling color pictures, exemplified by a system exchanging color picture data over a network, such as the Internet, or a desk top publishing system for carrying out the editing operations, including color picture data, with the aid of a computer, are rapidly coming into extensive use.

[0003] The devices handling color pictures differ in input/output characteristics of expressible colors or gradations, depending on the device sorts, such that, if the color picture data are simply exchanged between the devices of different sorts, the colors reproduced become different from one device to another. For example, if, when a picture displayed on a monitor is output as a hard copy on a printer, the color gamut that may be represented on a monitor differs from the gamut that may be represented on a printer, it may be an occurrence that the color of a picture represented on the monitor differs from that of a picture output as a hard copy by the printer.

[0004] As a large variety of systems handling color pictures have been put to practical use, the concept of a so-called device independent color in which color pictures of the same colors may be reproduced between different sorts of the devices on the system has become crucial. The system which implements the device independent color is generally termed a color management system, a representative example of which is Colorsync of MacOS and ICM of Windows.

[0005] In the color management system, the device independent color is implemented by matching physical colorimetric values of the color signals of the input/output device. Specifically, color signals of an input picture from an input device, such as a video camera 61, a scanner 62 and a monitor 63, are converted into color signals in a device-independent color space (e.g. CIE/XYZ, CIE/L*a*b*) based on a device profile the color gamut conversion equation or the color gamut conversion table of which has been defined from one device to another, as shown in Fig.1. When the color signals are output from output devices, such as a monitor 63 or a printer 64, these color signals are converted into output color picture signals in the color space associated with the devices based on a device profile having a color gamut changing equation or a color gamut conversion table defined from one device to another.

[0006] Thus, if, with the color management system, color signals are converted from an input picture color signal of an input system to an output color picture signal of an output system, the input picture color signal is converted once into color signals in a device-independent color space, based on the device profile, for realization of the device-independent color, as shown in Fig.2. Meanwhile, the device profile is a file in which a color gamut changing equation or a color gamut conversion table has been defined. Stated differently, the device profile is a file in which there are stored a set of parameters calculated from the relation between the color signal values of the device (e.g. RGB or CMYK) and color values as measured by e.g. a colorimeter (e.g. XYZ or L*a:b*).

[0007] In case the relation between color signal values of a device and color values of a picture realized by these color signal values is non-linear, as in a printer, the routine practice is to use a lookup table (LUT) as a device profile.

[0008] Color printing in a color printer is realized by controlling the amount of deposition of colorants of cyan (c), magenta (m) and yellow (y) with black (k). However, in a control interface for each of specified printer types, color signals for printing received in particular by machine types of general usage or application are mostly not cmy(k) but RGB signals. Since picture input equipment, such as digital cameras, output equipment, such as display monitors, or the application software, usually handle colors represented in RGB, it is naturally convenient to issue commands with RGB for printing as well. It should be noted that the control interface means a so-called printer driver software, operating on a calculating device, such as a personal computer, distinct from the printer, a firmware operating on a calculating device mounted within the main body unit of the printer, or an electronic circuit within the inside of the main body unit of the printer, and denotes a processor for converting input color signals for printing into control signals for a specified printer. Inherently, RGB is device signals, such as signals of monitors or cameras. Recently, as standard encoding in the sRGB color space [IEC 61966-2.1] has come into extensive use, control interfaces of printers of different types receiving these data are now able to make substantially common interpretation. However, the color gamut reproducible with a printer is locally wider than the color gamut limited with the encoding of the sRGB color space, such that, if a printer receives signals encoded with sRGB, the color reproducing capabilities of the printer cannot be exploited sufficiently.

[0009] On the other hand, in the DCF Version 1.0 [JEIDA-49-2-1998], extensively used in Japan, there is shown a guideline for encoding picture data with the YCC (luminance chromaticity separation color space) uniquely associated